

Claims:

1. A composition comprising lithium or a salt thereof and an agent that creates an environment favorable for axonal growth and a pharmaceutically acceptable carrier.
2. The composition of claim 1, wherein the agent is selected from the group consisting of NGF, BDNF, NT-3, 4, 5, or 6, CNTF, LIF, IGFI, IGFII, GDNF, GPA, bFGF, TGFB, and apolipoprotein E.
3. A vehicle for administration to a subject, comprising the composition of claim 1.
4. The vehicle of claim 3, which is a tube, catheter or stent.
5. The vehicle of claim 4, which is a syringe.
6. The composition of claim 1, which is in the form of a tablet.
7. A method for promoting axonal growth in a neural cell, comprising contacting the neural cell with an amount of lithium or salt thereof sufficient to stimulate axonal growth, such that axonal growth occurs.
8. The method of claim 7, wherein the neural cell is a central nervous system (CNS) neural cell.
9. The method of claim 7, wherein the neural cell is in the peripheral nervous system.
10. A method for treating a subject that has suffered a traumatic injury in which nerve cell injury has occurred, comprising administering to the subject lithium or a salt thereof, in an amount sufficient to stimulate axon regeneration, such that the subject is treated.
11. The method of claim 10, wherein administering comprises providing lithium or a salt thereof to the site of nerve cell injury.
12. The method of claim 11, wherein the lithium or a salt thereof is injected into the site of nerve cell injury.
13. The method of claim 10, further comprising administering an agent that creates an environment favorable for axonal growth.
14. The method of claim 13, wherein the agent is selected from the group consisting of NGF, BDNF, NT-3, 4, 5, or 6, CNTF, LIF, IGFI, IGFII, GDNF, GPA, bFGF, TGFB, and apolipoprotein E.
15. The method of claim 10, wherein the nerve cell injury is a spinal cord injury.
16. The method of claim 10, wherein the nerve cell injury is a peripheral nervous system injury.

17. The method of claim 10, wherein the nerve cell injury is an optic nerve injury.
18. A method for treating a subject for a state characterized by diminished potential axonal growth, comprising administering to the subject lithium or a salt thereof, in an amount sufficient to stimulate axonal growth, such that the subject is treated.
- 5 19. The method of claim 18, wherein the state is a CNS disorder.
20. The method of claim 18, wherein the state is a peripheral nervous system disorder.
21. The method of claim 18, wherein the state is glaucoma.
22. A method for stimulating axon growth of a neural cell in vitro, comprising contacting a neural cell with an amount of lithium or salt thereof sufficient to stimulate axon growth, such that the neural cell grows at least one axon.
- 10 23. The method of claim 22, wherein the neural cell is obtained from a subject.
24. The method of claim 22, wherein the neural cell is a cell that was differentiated from a stem cell.
25. A method for treating a subject for a state characterized by diminished potential axonal growth or a traumatic injury in which nerve cell injury has occurred, comprising administering to the subject a cell obtained according to the method of claim 22.
26. A method for treating a subject for a state characterized by diminished potential axonal growth or a traumatic injury in which nerve cell injury has occurred, comprising obtaining a neural cell from the subject, treating the cell according to the method of claim 22, and administering the neural cell with at least one axon back into the subject.
- 20 27. A method for preventing neural cell degeneration, comprising contacting the neural cell with an agent that increases the amount of Bcl-x_L in the neural cell, such that neural cell degeneration is prevented.
28. The method of claim 27, comprising contacting the neural cell with a nucleic acid encoding a Bcl-x_L protein or portion thereof sufficient for preventing neural cell degeneration.
- 25 29. The method of claim 27, comprising contacting the neural cell with a Bcl-x_L protein, such that the protein enters the neural cell.
30. A method for treating a neurodegenerative disease in a subject, comprising contacting neural cells of the subject that are undergoing neurodegeneration with an agent that
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increases the amount of Bcl-x_L in the neural cell, such that the neurodegenerative disease is treated in the subject.

31. A method for treating a subject having a partial or complete sectioning of the spinal cord or a nerve, comprising

5 providing the ends of the spinal cord or nerve within less than about 100 μm distance from each other; and

contacting at least one cell from the spinal cord or nerve with an agent that increases the level of bcl-2 protein within the cell,

such that the cell grows at least one axon, to thereby treat the subject.

- 10 32. The method of claim 31, wherein the agent is provided at the site of the sectioning of the spinal cord or nerve.

33. The method of claim 31, wherein the agent is lithium or a salt thereof.